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ABSTRACT

This is one of a series of 20 booklets designed for participants in an in-service course for teachers of elementary mathematics. The course, developed by the University of Illinois Arithmetic Project, is designed to be conducted by local school personnel. In addition to these booklets, a course package includes films showing mathematics being taught to classes of children, extensive discussion notes, and detailed guides for correcting written lessons. This booklet contains exercises on maneuvers on lattices, a summary of the problems in the film "A Seven-Fold Lattice," and the supplement. (MK)

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THE ARITHMETIC PROJECT COURSE FOR TEACHERS

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TOPIC: Introduction to Maneuvers on Lattices.

FILM: A Seven-Fold Lattice, Grade 5

SUPPLEMENT: Maneuvers on Lattices

5

NAME: .....

SE 031 105

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BOOK FIVE

MANEUVERS ON LATTICES

This lesson is based on the accompanying booklet, "Maneuvers on Lattices". It is important that the booklet be read in conjunction with the lesson, as indicated.

I.

40	41	42	43	·					
30	31	32	33	34	35	36	37	38	39
20	21	22	23	24	25	26	27	28	29
10	11	12	13	14	15	16	17	18	19
	1	2	3	4	5	6	7	8	9

Read pages 1 through 4 of the booklet. Then, using the lattice above, do these:

1. 30 → = _____

2. 31 ← = _____

3. 30 ↑ = _____

4. 42 ↑ = _____

5. 52 ↓ = _____

6. 12 ↓ = _____

7. 23 □ = 13 What arrow?

8. □ ↑ = 32 What number?

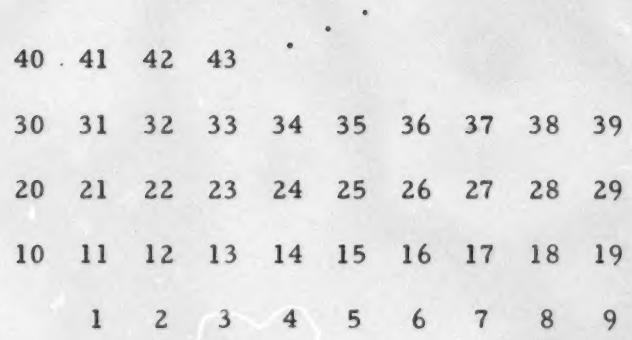
II.

Read the left-hand column of page 5 in the booklet.

More problems:

1. 11↓ + 11↓ + 11↓ = _____
2. 11↓ + 12↓ + 13↓ + 14↓ = _____
3. 11↓ + 12↓ + 13↓ + 14 = _____
4. 11↓ + 12↓ + 13 + 14 = _____
5. 11 + 12 + 13 + 14 = _____
6. 13↓ + 4← + 2→ = _____
7. 10 + 17↓ = _____
8. 10 + 53↓ = _____
9. 10 + 98↓ = _____
10. 14↑ + 26↓ = _____
11. 14↑ + 27↓ = _____
12. 17↑ - 7 = _____
13. 107↑ = _____
14. 1,672↑ - 3 - 3 - 3 = _____

tear here



The lattice on page one is reproduced here for your convenience.

III.

Finish page 5 and read page 6 of the booklet.

1. 16 ↑↑↓↑↑↑↓ = _____

2. 39 ↑↑↓↑↑↑↓ = _____

3. 2 ↑↑↓↑↑↑↓ = _____

4. 2 ↑↑↑↑↑↓↓ = _____

5. 17 ↑↑↑↑↑↓↓ = _____

6. 25 ↓↓↑↑↑↑↑ = _____

7. 100 ↓↓↑↑↑↑↑↑ = _____

8. 14 →↑↑↓→↓←↑→↑← = _____

9. 36 →↑↑↓→↓←↑→↑← = _____

10. 36 →→→↑↑↑↑←←↓↓ = _____

11. 23 →↑←↓ →↑←↓ →↑←↓ = _____

IV.

1. 5 ↗ = 16

2. 14 ↗↙↗↙↗↙ = _____

3. 72 ↗↗↙↗↗↗↙ = _____

4. 5 ↗↖ = _____ (The answer is not 5.)

5. 13 ↗↖↗↖↗↖ = _____

6. 52 ↗↓← = _____

7. 2,607 ↑→↙ = _____

8. 85 ↗↓←↗↓←↗↓← = _____

9. 85 ↗↗↗↓↓↓←←← = _____ (Contrast the actual paths in #8 and #9.)

V.

Read page 7 of the booklet.

1. (a) Use the smallest possible number of arrows to make this problem true:

25 [ ] = 41

What is the largest number of arrows that can be used? _____

(b) This time you are restricted to diagonal arrows. Use the smallest possible number of arrows to make this true.

25 [ ] = 41

(c) Same problem, but use only horizontal and vertical arrows.

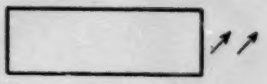
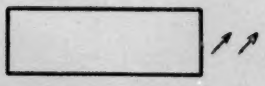
25 [ ] = 41

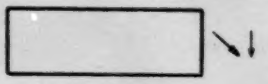
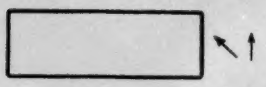
8

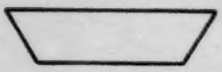
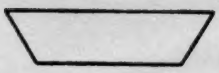
2. 22 ↑↑→↑ + 1,047 ↓↓←↓↑ = _____

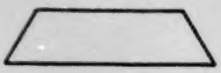
How might a child describe a shortcut for this problem?

3. (Omitted.)

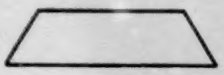
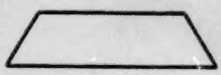
4. (a)  +  = 58

(b)  +  = 86

5. (a) 192  + 65  = 215

(b) 192  − 65 = 127

(c) Explain why this problem is impossible:

192  − 65  = 129

6.

30	31	32	33	. . .					
20	21	22	23	24	25	26	27	28	29
10	11	12	13	14	15	16	17	18	19
□	1	2	3	4	5	6	7	8	9

Put a number in the □ so that the pattern is preserved.

7.

30	31	32	33	.					
20	21	22	23	24	25	26	27	28	29
10	11	12	13	14	15	16	17	18	19
	1	2	3	4	5	6	7	8	9

Put a number in the △ so that the pattern is preserved. Describe the pattern you have in mind.

VI.

Read pages 8 and 9 of the booklet.

15	$15\frac{1}{2}$								
10	$10\frac{1}{2}$	11	$11\frac{1}{2}$	12	$12\frac{1}{2}$	13	$13\frac{1}{2}$	14	$14\frac{1}{2}$
5	$5\frac{1}{2}$	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$	8	$8\frac{1}{2}$	9	$9\frac{1}{2}$
0	$\frac{1}{2}$	1	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3	$3\frac{1}{2}$	4	$4\frac{1}{2}$
a	b	c	d	e	f	g	h	i	j

Is $36\frac{1}{2}$ → → ↑ ↖ ↙ ↓ ← ↗ ↗ a whole number? _____

Is $36\frac{1}{2}$ → → ↑ ↖ ↙ ↓ ← ↗ ↗ bigger or smaller than $36\frac{1}{2}$? _____

What column is $36\frac{1}{2}$ in? _____

VII.

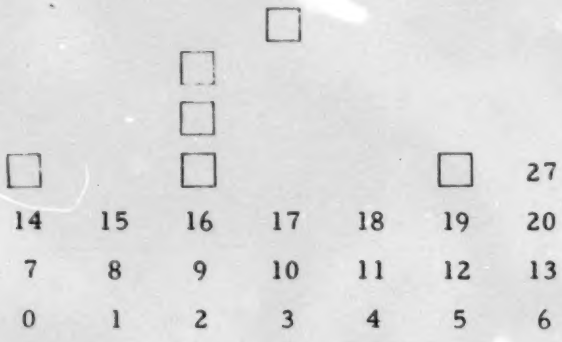
Construct a lattice different from any in this lesson. Write a series of problems dealing with your lattice and try them with your class. Give your lattice, the questions (with correct answers), and a few sentences describing how it went. Use additional sheets of paper if you wish.

Summary of Problems in the Film

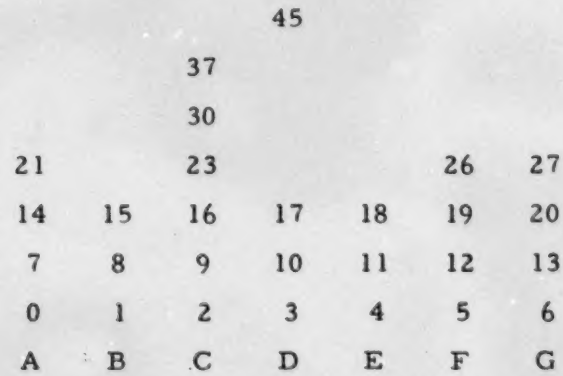
"A Seven-Fold Lattice"

5th Grade, Browne School, Watertown, Massachusetts
Teacher: Francis X. Corcoran

This lattice was written on the board while the class watched. What numbers go in the boxes? (Boxes were erased when the numbers were written.)



Going straight up are columns of numbers which I'll call A, B, C, D, etc. The chart keeps right on going as high as you can imagine. I'll name a number, and you tell me which column the number is in.



18	(E)
28	(A)
29	(B)
50	(B)
70	(A)
100	(C)
700	(A)

Give me other numbers in Column A that we haven't done so far.

(707 , 7,000)

Here is a code for writing numbers:

$18\uparrow\ =$

That stands for a number somewhere on the chart. (25)

$63\uparrow\ =$ (70)

$113\uparrow\ =$ (120)

$40\uparrow\ =$

$40\uparrow\uparrow\ =$ (54)

$0\uparrow\uparrow\uparrow\uparrow\uparrow\ =$

$1\uparrow\uparrow\uparrow\uparrow\uparrow\uparrow\uparrow\ =$ (Wrong answer: 49)

I'd like 10 arrows after the 9 . What's a short way of writing it?

$9\uparrow^{10}\ =$ (79)

$60\uparrow^{40}\ =$ (340)

$301\uparrow^{100}\ =$ (1,001)

We can have other kinds of arrows.

$38\rightarrow\ =$ (39)

$98\rightarrow\rightarrow\ =$ (100)

$23\nearrow\ =$ (31)

$23\nwarrow\ =$

$23\nearrow\nwarrow\ =$

I'm thinking of a number that goes in the box, and I'm going to write some arrows after it. Is the answer bigger or smaller than the number I started with? Bigger or smaller by how much?

□ ↑ ↗ ↓ (Bigger by 8)

□ ↗ ↓

□ ↑ ↑ =

□ ↑ ↑ ↓ ↓ ↑ = (Bigger by 7)

□ ↗ ↓ → ↗ ↑ ← ↖ ↘ = (The same)

Does anyone know a short cut for doing that?

□ ↑ = (7 bigger)

□ ← = (1 less)

Here's a problem. You may use pencil and paper. Start with the number 32 and put some arrows in to get an answer of 58.

32 ▱ = 58

How many arrows can you use? ("As many as you want.")

Can anyone do it with three arrows?

Last two problems. You must put the same arrows in each shape.

18 ▱ + 29 ▱ = 79

18 ▱ + 29 ▱ = 80